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EXAMINER

MONDT, JOHANNES P

ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 07/12/2002

Please find below and or attached an Office communication concerning this application or proceeding.

Application No.	Applicant(s)
09/719,807	MCINERNEY ET AL
Office Action Summary	
Examiner	Art Unit
Johannes P Mondt	2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____

2a)☐ This action is **FINAL** 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,6-9,11,12,16,18-24,31,32,46 and 48-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-2, 6, 9, 11-12, 16, 18-24, 31-32, 46, and 48-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a)☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1. ☐ Notice of References Cited, PTO-892
2. ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
3. ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 7
4. ☐ Interview Summary, PTO-413, Paper No(s). _____
5. ☐ Notice of Informal Patent Application, PTO-152
6. ☐ Other: _____

DETAILED ACTION

Information Disclosure Statement

The examiner has considered the items listed in the Information Disclosure Statement filed 2/20/2001 entered as Paper No. 7.

Claim Objections

1. ***Claim 1*** is objected to because of the following informalities: the verbiage "*on the semi-conductor medium*" should be replaced with "*by at least the semi-conducting medium*". Appropriate correction is required.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention

1. ***Claims 2, 6, 9, 12, 16, 24, and 32*** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the verbiage "preferably" renders the claim's content indefinite, and should be removed, either by incorporating the further limitation into the claim without the characterization of said further limitation as merely preferable, or by removing said further limitation following said verbiage altogether.

2. ***Claims 18-20*** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, because of their dependence, either directly or

indirectly on claim 16 rejected to under 35 USC 112, second paragraph as detailed above.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. ***Claims 1-2, 6, 9, 11-12, 16, 18-24, 31-32, 46, and 48-50*** are rejected under 35 U.S.C. 102(b) as being anticipated by Paoli (5,228,049).

With regard to claim 1: Paoli teaches (Figures 1, 3A, 3B, and 3C) a semiconductor device 10 (cf. abstract, first sentence; column 3, lines 50-51) comprising a semiconducting medium 22-26 which defines a junction through the active region 24 between first and second cladding layers 22 and 26 (cf. column 3, line 60 – column 4, line 5), a first electrical contact 28/30 (cf. column 4, lines 3-5 and lines 11-12) and a second electrical contact 32 (cf. column 4, lines 11-12), the respective electrical contacts 28/30 and 32 respectively located spaced-apart from each other on the semiconductor medium 22-26 and in electrical contact with the semiconductor medium 22-26 for pumping current through the junction 24 for forming an active region 24 in the junction characterized in that at least one (namely: first electrical contact 28/30) of the first and second electrical contacts defines an outline area defined by the lateral borders of region 28 on the semiconductor medium 22-26 for determining the shape and area of the active region 24, and the at least one of the first and second electrical contacts

28/30 and 32 (namely: first electrical contact 28/30) forms an actual contact area or areas (namely: areas in which 28 has *not* been etched away, or, in the alternative: bombarded with protons to substantially alter resistivity: see Figures 3B and 3C and column 5, lines 15-61), in which that one (28/30) of the first and second electrical contacts (28/30 and 32) is in actual electrical contact with the semiconductor medium 22-26, and defines non-contact areas within said outline area in which no electrical contact takes place between that one (28/30) of the first and second electrical contacts 28/30 and 32 and the semiconductor medium 22-26 (namely: areas in which 28 *has* been etched away, or, in the alternative: bombarded with protons to substantially alter resistivity, see Figures 3B and 3C and column 5, lines 15-61), for the specific purpose of varying the current density spatially in the active region (cf. title, abstract, and column 1, lines 40-53), for which, in view of the above described constitution, inherently are at the user's disposal (a) the ratio of the actual contact area to that of the non-contact area, variable with (b) the outline area. In conclusion, Paoli anticipates claim 1.

With regard to claim 2: by virtue of the substantial absence of any remaining electrical conductivity in any portion of region 28 as an inherent aspect of the process of etching away the GaAs material (highly doped, hence conductive, p+ GaAs) in said portion, the ratio of actual contact area to non-contact area also represents the proportion of overall current density in 24, while it is inherent, through Ohm's law or any nonlinear improvement thereof, in any variation of the electrical conductivity in any specific direction that the associated current density is varied thereby and in the same direction. As a corollary of this inherent property linking variation in electrical

conductivity with variation in current density in the same direction of said variation of electrical conductivity: in particular when the need would arise to progressively vary the current density in the active region. by the simple proportionality between electrical conductivity and current density under fixed applied voltage as given by Ohm's law. or any nonlinear improvement of said Ohm's law. such progressive variation of the current density would be achieved by a corresponding progressive variation of said ratio. Therefore. Paoli anticipates claim 2.

With regard to claim 6: the semiconductor device of claim 1 as anticipated by Paoli is characterized in that the ratio of actual contact to non-contact area of the first electrical contact 28/30 is varied in a transverse direction across the active region 24 relative to the longitudinal direction of the active region 24 for varying the current density transversely across the active region (cf. abstract. second sentence) and is progressively reduced towards opposite side edges of 24 (cf. Figures 3A. 4A and 4C: column 6. lines 32-34 and lines 40-45). which extend in a generally longitudinal direction relative to 24 for progressively reducing the current density in 24 towards the respective side edges: and preferably is progressively reduced towards opposite side edges of 24 which diverge away from each other in a generally longitudinal direction (see Figure 3A) relative to 24 for progressively reducing the current density in 24 towards the respective diverging side edges. With regard to the above sentence please note that the gaussian-like mode taught by Paoli is the exponential of minus a normalized lateral coordinate and hence progressively reduces towards the outskirts of the domain. Therefore. Paoli anticipates claim 6.

With regard to claim 9: the semiconductor device of claim 1 as anticipated by Paoli is characterized in that the ratio of the actual contact area to non-contact area of the first electrical contact 28/30 is varied in both longitudinal and transverse directions relative to the longitudinal direction of 24, as seen perhaps most clearly from Figure 3B, although also in evidence through Figure 3C. Therefore, Paoli anticipates claim 9.

With regard to claim 11: it is inherent for current density along lines of constant current density to be constant along said lines of constant current density. Any arrangement of said ratio would therefore satisfy the requirement of claim 11. Therefore, Paoli anticipates claim 11.

With regard to claim 12: the semiconductor device of claim 1 as anticipated by Paoli is characterized in that the shape and areas of the non-contact areas are such that the current density in areas of the active region 24 that correspond to the non-contact areas is greater than zero by virtue of the finite value of the resistivity in said non-contact areas, as is evident from first principles of electricity. Furthermore, the shape and area of said non-contact areas is such as to avoid induced grating effects by virtue of the stated current density profile (see Figures 3) in which no such grating effects are in evidence, because no modal distortion of any kind is present (cf. column 6, lines 40-45). Therefore, Paoli anticipates claim 12.

With regard to claim 16: the semiconductor device of claim 1 as anticipated by Paoli is characterized in that the first electrical contact 28/30 comprises a main electrical contact 30 (cf. column 4, line 11) and a plurality of spaced-apart secondary electrical contacts 28 (see the cross-sectional representation of region 28 in Figures 1 and 3A.

and the marked regions within region 28 in plan view in Figures 3B and 3C) adapted to be electrically connected to the main contact 30, together forming the actual contact area 28/30 and defining non-contact areas therebetween, while the secondary contacts within region 28 are electrically connected to the main contact 30. Therefore, Paoli anticipates claim 16.

With regard to claim 18: the semiconductor device of claim 1 as anticipated by Paoli in Figure 3C is characterized in that the secondary contacts within region 28 are provided by a plurality of elongated spaced-apart and substantially parallel finger contacts extending from the main contact 30. Therefore, Paoli anticipates claim 18.

With regard to claim 19: said finger contacts forming the secondary contacts taper from their respective proximal ends at the upper side of Figure 3C to their distal ends in the lower side of Figure 3C. Therefore, Paoli anticipates claim 19.

With regard to claim 20: the semiconductor device of claim 1 as anticipated by Paoli is characterized in that the main contact 30 extends substantially longitudinally relative to the active region 24 (see Figures 1 and 3A, in which 24 and 30 are substantially parallel to each other), and the secondary contacts within region 28 extend transversely from the main contact in a direction generally transverse in relation to the active region, because the aforementioned secondary contacts are created either through either etching or proton bombardment in a direction transverse to 24 (cf. column 5, lines 15-61). Therefore, Paoli anticipates claim 20.

With regard to claim 21: the semiconductor device of claim 1 as anticipated by Paoli is characterized in that for the preferred embodiment wherein ion bombardment is

used to create regions of high resistivity (cf. column 4, lines 60-63) each proton injected into region 28 creates a hole or opening of high resistivity, said hole or opening being the non-contact area created by ion bombardment. Therefore, said semiconductor device is characterized in that the first electrical contact 30/28 comprises a single contact, which forms the actual contact area, the single contact having a plurality of openings therethrough, which form the non-contact areas. Therefore, Paoli anticipates claim 21.

With regard to claim 22: the semiconductor device of claim 1 as anticipated by Paoli is characterized in that the junction is a p-n junction, because the active region 24 is flanked by an n-cladding layer 22 and a p-cladding layer 26 (cf. column 3, line 63 – column 4, line 5). Therefore, Paoli anticipates claim 22.

With regard to claim 23: the semiconductor device of claim 1 as anticipated by Paoli is characterized in that the first and second electrical contacts 30/28 and 32, respectively, are located on respective opposite surfaces (upper and lower, respectively, with reference to Figures 1 and 3A) of the semiconductor device for pumping the current through the active region 24 of the junction. Therefore, Paoli anticipates claim 23.

With regard to claim 24: the semiconductor device of claim 1 as anticipated by Paoli is characterized in that said semiconductor device is an optical semiconductor device (namely: laser, cf. title), the longitudinal direction of the active region 24 (i.e., a horizontal direction out of the paper in Figures 1 and 3A) being defined by the direction of light propagation in the active region by virtue of the TE (transverse electric, note the

electric field is vertical in the Figures as is the current density) nature of the output mode (cf. column 3, lines 14-18; see also "Background of the Invention", column 1, lines 17-20) and the ratio of actual contact area to non-contact area of the first electrical contact is varied for inducing a current density profile (this is the very subject and goal of the patent by Paoli; see abstract, third sentence, and local references above) in the active region, and, advantageously, the aforementioned ratio is varied transversely across said direction of light propagation in the active region (because said ratio is varied in the direction at which the current profile is to be tailored), the transverse profile of which substantially coincides with the desired transverse profile of light intensity at the corresponding location in the active region 24 (inherent in the generation mechanism of said light through charge carriers moving in the direction of the applied electric field, i.e., vertically) , while the first electrical contact 30 defines the outline area (i.e., the area bounded by the circumference of the area of 30 that is overlaying 28 prior to either etching or ion bombardment), while, advantageously the second electrical contact 28 defines the actual contact area and non-contact areas. Therefore, Paoli anticipates claim 24.

With regard to claim 31: The device of claim 1 would necessarily have to be formed in order to function. Claim 31 fails to further limit the device of claim 1 other than simply state the formation of each of its components.

With regard to claim 32: The device of claim 2 would necessarily have to be formed in order to function. Claim 32 fails to further limit the device of claim 2 other than simply state the formation of each of its components.

With regard to claim 46: The device of claim 16 would necessarily have to be formed in order to function. Claim 46 fail to further limit the device of claim 16 other than simply state the formation of its components.

With regard to claim 48: The device of claim 18 would necessarily have to be formed in order to function. Claim 48 fails to further limit the device of claim 18 other than simply state the formation of each of its components.

With regard to claim 49: The device of claim 19 would necessarily have to be formed in order to function. Claim 49 fails to further limit the device of claim 19 other than simply state the formation of each of its components.

With regard to claim 50: The device of claim 20 would necessarily have to be formed in order to function. Claim 50 fails to further limit the device of claim 20 other than simply state the formation of each of its components.

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Lindsey et al (4,791,646).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 703-306-0531. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 703-308-6601. The fax phone numbers

for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

JPM
July 7, 2002